CLAIMS

What is claimed is:

1. A cartridge for conducting a chemical reaction, the cartridge comprising:
   a) a body having at least one flow path formed therein; and
   b) a reaction vessel extending from the body, the vessel comprising:
      i) a rigid frame defining the side walls of a reaction chamber, wherein the frame includes at least one channel connecting the flow path to the chamber; and
      ii) at least one sheet attached to the rigid frame to form a major wall of the chamber, wherein the major wall is sufficiently flexible to conform to a thermal surface.

2. The cartridge of claim 1, wherein the vessel includes first and second flexible sheets attached to opposite sides of the rigid frame to form opposing major walls of the chamber.

3. The cartridge of claim 1, wherein at least two of the side walls are optically transmissive and angularly offset from each other by about 90°.

4. The cartridge of claim 3, wherein at least two additional side walls have retro-reflective faces.

5. The cartridge of claim 1, wherein the ratio of the width of the chamber to the thickness of the chamber is at least 4:1, and wherein the chamber has a thickness in the range of 0.5 to 2 mm.

6. The cartridge of claim 1, wherein the vessel includes at least two separate ports in fluid communication with the reaction chamber, and wherein the body includes at least a first channel in fluid communication with the first port and at least a second channel in fluid communication with the second port.

7. The cartridge of claim 1, wherein the body has formed therein:

i) a sample flow path;

ii) a separation region in the sample flow path for separating a desired analyte from a fluid sample; and

iii) an analyte flow path extending from the separation region, wherein the channel in the vessel connects the analyte flow path to the reaction chamber.

8. The cartridge of claim 7, wherein the separation region in the body comprises:

a) a lysing chamber in the sample flow path for lysing cells or viruses in the sample to release material therefrom; and

b) at least one solid support positioned in the lysing chamber for capturing the cells or viruses to be lysed.

9. The cartridge of claim 1, wherein the cartridge is in combination with an instrument having:
   a) at least one thermal surface for contacting the major wall of the reaction chamber;
   b) means for increasing the pressure in the reaction chamber, wherein the pressure increase in the chamber is sufficient to force the major wall to contact and conform to the thermal surface; and
   c) at least one thermal element for heating or cooling the surface to induce a temperature change within the chamber.

10. The cartridge of claim 9, wherein the vessel includes first and second flexible sheets attached to opposite sides of the rigid frame to form opposing major walls of the chamber, the instrument includes first and second thermal surfaces formed by opposing plates positioned to receive the chamber between them, and the pressure increase in the chamber is sufficient to force the major walls to contact and conform to the inner surfaces of the plates.

11. The cartridge of claim 1, wherein at least two of the side walls of the reaction chamber are optically transmissive and angularly offset from each other, and wherein the cartridge is in combination with an optics system having at least one light source for exciting a reaction mixture in the chamber through a first one of the optically transmissive side walls and having at least one detector for detecting light emitted from the chamber through a second one of the optically transmissive side walls.

12. A cartridge for conducting a chemical reaction, the cartridge comprising:

a) a body having at least one flow path formed therein; and

b) a reaction vessel extending from the body, the vessel comprising:

i) two opposing major walls;

ii) side walls connecting the major walls to each other to define a reaction chamber, wherein at least two of the side walls are optically transmissive and angularly offset from each other; and

iii) at least one channel connecting the reaction chamber to the flow path in the body.

13. The cartridge of claim 12, wherein the vessel includes:

a) a rigid frame defining the side walls of the chamber; and

b) first and second flexible sheets attached to opposite sides of the rigid frame to form the major walls of the chamber.

14. The cartridge of claim 12, wherein the optically transmissive side walls are angularly offset from each other by about 90°.

15. The cartridge of claim 12, wherein at least two additional side walls of the chamber have retro-reflective faces.

16. The cartridge of claim 12, wherein the ratio of the width of the chamber to the thickness of the chamber is at least 4:1, and wherein the chamber has a thickness in the range of 0.5 to 2 mm.

17. The cartridge of claim 12, wherein the vessel includes at least two separate ports in fluid communication with the reaction chamber, and wherein the body includes at least a first channel in fluid communication with the first port and at least a second channel in fluid communication with the second port.

18. The cartridge of claim 12, wherein the body has:

i) a sample flow path;

ii) a separation region in the sample flow path for separating a desired analyte from a fluid sample; and

iii) an analyte flow path extending from the separation region, wherein the channel in the vessel connects the analyte flow path to the reaction chamber.

19. The cartridge of claim 18, wherein the separation region comprises:

a) a lysing chamber in the sample flow path for lysing cells or viruses in the sample to release material therefrom; and

b) at least one solid support positioned in the lysing chamber for capturing the cells or viruses to be lysed.

20. The cartridge of claim 12, wherein the cartridge is in combination with an instrument having:

a) opposing plates positioned to receive the chamber of the vessel between them;

b) means for increasing the pressure in the chamber, wherein the pressure increase in the chamber is sufficient to force the major walls to contact and conform to the inner surfaces of the plates; and

c) at least one thermal element for heating or cooling the surfaces of the plates to induce a temperature change within the chamber.

21. The cartridge of claim 12, wherein the cartridge is in combination with an optics system having at least one light source for exciting a reaction mixture in the chamber through a first one of the optically transmissive side walls and having at least one detector for detecting light emitted from the chamber through a second one of the optically transmissive side walls.